UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
1110 West Washington Street
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Phil Mook
Western Execution Branch Chief
Department of the Air Force
AFCEC/CIBW
3411 Olson Street
McClellan, CA 95652

Re: Revised Draft Final Addendum #2 Remedial Design and Remedial Action Work Plan for Operable Unit 2, Revised Groundwater Remedy, Site ST012, Former Williams AFB

Dear Mr. Mook:

The U.S. Environmental Protection Agency (EPA) and the Arizona Department of Environmental Quality (AZDEQ) (hereafter the Regulatory Agencies have reviewed the above-mentioned document to determine if the proposed remedial action is acceptable for implementation at the ST012 Site.

Conceptually, sulfate reduction (i.e., enhanced sulfate reduction/enhanced bioremediation (EBR) using injected sulfate as an electron acceptor, and afterwards monitored natural attenuation [MNA] relying on natural sulfate reduction) seems likely to be useful for degradation of the contaminants of concern (COCs) dissolved in groundwater over time. However, given the considerable mass of source material (both mobile and residual light nonaqueous phase liquid [LNAPL]) remaining at Site ST012, the practical efficacy of EBR/MNA towards achieving Site remedial goals in the timeframe established in the 2013 Final Record of Decision Amendment 2 (2013 RODA 2) Groundwater, Operable Unit 2 is highly uncertain from the Agencies' perspective. Based upon Air Force's (AF's) estimates of remaining mass, the Regulatory Agencies have independently developed modeled estimates of time to remediation for EBR that exceed a century. This was not the intent of the remedy selected in the 2013 RODA 2, which provided the expectation of meeting remedial action objectives within 20 years.

The 2013 Record of Decision selected Steam Enhanced Extraction (SEE) to be followed by Enhanced Bioremediation. As stated in the original draft proposed plan dated January 4, 2013, *"After most of the LNAPL is removed by SEE, the remedy would transition to Enhanced Bioremediation"* to meet the remedial action objective. This documents a common understanding amongst the AF and Regulatory Agencies' project team that the bulk of the mass of LNAPL needed to be removed first by SEE to enable biodegradation of remaining contamination within the 20-year timeframe. This has always been the expectation of the regulatory agencies, and the reason why performance criteria for transition of the remedy to EBR was established in the original RDRA workplan. However, at the time the SEE was terminated and dismantled, the criteria established in the workplan documents had not been attained. Remaining groundwater benzene concentrations as high as 270,000 ug/l have been detected recently, exceeding the 100 -500 ug/l specified as transition criterion in the workplan for EBR to meet the

timeframe specified in the 2013 RODA 2. The criterion for mass removal of less than 10 percent of peak recovery rate specified in the approved 2014 RDRA workplan was also not attained as vapor recovery alone was around 25 percent of peak recovery rate with approximately 3000 lbs. recovered per day, in addition to thousands of gallons of LNAPL also being recovered. The SEE system was terminated after 302.4 million pounds of steam were injected, 94% of what was originally estimated.

Based upon the operational data from the SEE and estimates of mass remaining, it appears that the SEE system design and operation was not sufficient to achieve the SEE system remedial goals, and bring the site into a condition suitable for implementation of EBR/MNA. Incomplete characterization of the total mass of LNAPL, and the full extent of the area needing to be treated, is related to the insufficiency of the SEE implementation to meet remedial goals, and continues to contribute to difficulties with remedial design and operations.

The Regulatory Agencies invoked informal dispute on the basis that 1) transition to EBR is premature due to transition criteria specified in the original workplan not being achieved and 2) the estimated contaminant mass remaining is too high to allow EBR/MNA meet the objectives in the ROD. Nevertheless, AF has indicated their desire to proceed with EBR at this time. Because the ability of EBR to remediate potentially nine million pounds of remaining LNAPL is questionable, additional pilot testing is warranted to collect essential site specific information to inform the full-scale design

The Regulatory Agencies understand that the Air Force wants to initiate EBR as described in the July 2017 RDRA Work Plan to begin addressing subsurface contamination at the site and to obtain data on which to base future contracts. The agencies strongly support characterization as critical to a successful future contracting strategy for the site, as well as to provide a baseline for monitoring remedy success.

The Agencies remain unconvinced that EBR will be effective at achieving remediation goals within the timeframe identified in the Work Plan, and do not believe that the Work Plan as proposed will provide the data required to determine if EBR is working as intended. However, we are willing to support the AF's proposal, provided the critical elements listed below are satisfactorily addressed in the work plan.

1. Site Characterization:

a) The Site must be adequately characterized, including the extent of dissolved benzene in excess of the cleanup criteria, the extent of LNAPL and, the COC content of the LNAPL, and the remaining mass of contaminants within the thermal treatment zone, for each of the three vertical zones.

b) Complete EBR baseline data from each zone must also be collected, validated, analyzed, and reported prior to initiating EBR. Microbial and geochemical data collected prior to the initiation of SEE or during SEE are not considered representative of current site conditions.

2. Plan for Evaluation of Remedy Performance:

a) AF must demonstrate that EBR implementation as planned can achieve remedial goals by the timeframe set forth in the 2013 RODA 2 using a predictive model and defensible input parameters, and using initial mass estimates developed based on the new data derived from the complete characterization of the site summarized in item a) above.

b) Estimates for the time of remediation (TOR) must be provided for each of the three zones (CZ, UWBZ and LSZ). The revised draft final addendum did not include any supporting data or calculations to indicate sulfate reduction as designed would achieve remedial goals in the desired timeframe.

c) Specific milestones (e.g., benzene concentration in LNAPL of XX at YY time after EBR implementation) based on COC concentrations in the site groundwater and LNAPL must be developed as derived from predictive modeling of COC attenuation over time.

d) The predictive modeling will require field tests of EBR conducted in the CZ and UWBZ to determine degradation rates in these hydrologic zones. Field tests of EBR in the UWBZ were specified in the Final Remedial Design and Remedial Action Work Plan (Amec, 2014) to take place before completing the EBR design, but these field tests have not been completed.

3. Plan for Monitoring

Set forth a monitoring plan and remedy success criteria (to be developed in conjunction with the Agencies) necessary to evaluate the success of the remedy following implementation.

a) Monitoring wells not used for injection or extraction must be used as the primary source of data for determining contaminant degradation; each of the 32 treatment ovals for full scale EBR implementation identified on the attached figure from the May BCT presentation must have at least one dedicated monitoring well (i.e., not used for injection or extraction) to evaluate remedy effectiveness in that location.

b) Monthly monitoring of sulfate concentrations must be conducted in monitoring wells for the first 12 months after the initiation of sulfate injection. Comparisons between model predictions and measures of sulfate concentration in monitoring wells should be reported monthly (e.g., graph the predicted sulfate concentration at each monitoring well and the field measures of sulfate in that monitoring well, as a function of time).

c) Monitoring will also include consistent and frequent site-wide monitoring of COC concentrations in LNAPL and in groundwater. In site locations where LNAPL cannot be collected from monitoring wells, soil cores must be obtained to collect this data from LNAPL-contaminated regions. This data is critical to evaluate the claim that EBR can remediate BTEX contained in LNAPL, and to evaluate the progress of the site to achieving the milestones developed from the predictive modeling.

4. Containment for Long Term Protectiveness

Ensure that the plume of contaminated groundwater and the injected TEA is controlled and that downstream drinking water sources are protected by providing recirculation during TEA injection and for a time period thereafter, as was called for in the approved May 2014 OU2 Remedial Work Plan.

The Regulatory Agencies acknowledge and appreciate AF's commitment as stated in the workplan cover letter, *"If recalcitrant areas of contamination exist three to 5 years post -EBR implementation, nominally, 10 years before the estimated time to complete, optimized or alternate*

remedial action, potentially including focused SEE will be evaluated, and, if appropriate, implemented in coordination with EPA and ADEQ." It is therefore critical that specific milestones be clearly established in the workplan to complete aquifer restoration and LNAPL removal within the 20 year timeframe of the 2013 RODA. The July 2017 Addendum 2 workplan does not establish criteria for evaluating remedy success or determining whether alternate remedial action is warranted.

We also agree with the statement that *"the time period from 2017 to 2020 as* (sic) *critical for the implementation of EBR in specific, and the efficacy of the ST012 remedy in general"*. The Agencies also believe the data elements listed above are essential to enabling the AF to evaluate the remedy effectiveness going forward, but these data elements are not provided in the July 2017 workplan. As a result, we remain unconvinced that the proposed approach will generate data useful for evaluating the effectiveness of the remedy or for informing future contract procurement.

The Agencies have repeatedly raised these aforementioned concerns in many formats over the past two years to no avail suggest a technical meeting to discuss incorporating these elements into the final workplan. The Regulatory Agencies are committed to supporting AF in the remediation of the site. However, if the Air Force is unwilling or unable to incorporate these critical elements into the workplan, then the Agencies might invoke formal dispute per the Federal Facility Agreement resulting in considerable project delay.

Sincerely,

Angeles Herrera
Assistant Director
Superfund Division
US Environmental Protection Agency

Tina Le Page
Waste Programs Division
Remedial Projects Section Manager
Arizona Department of Environmental Quality

Attachment